

How The Latest Standards Impact Chemical Laboratories

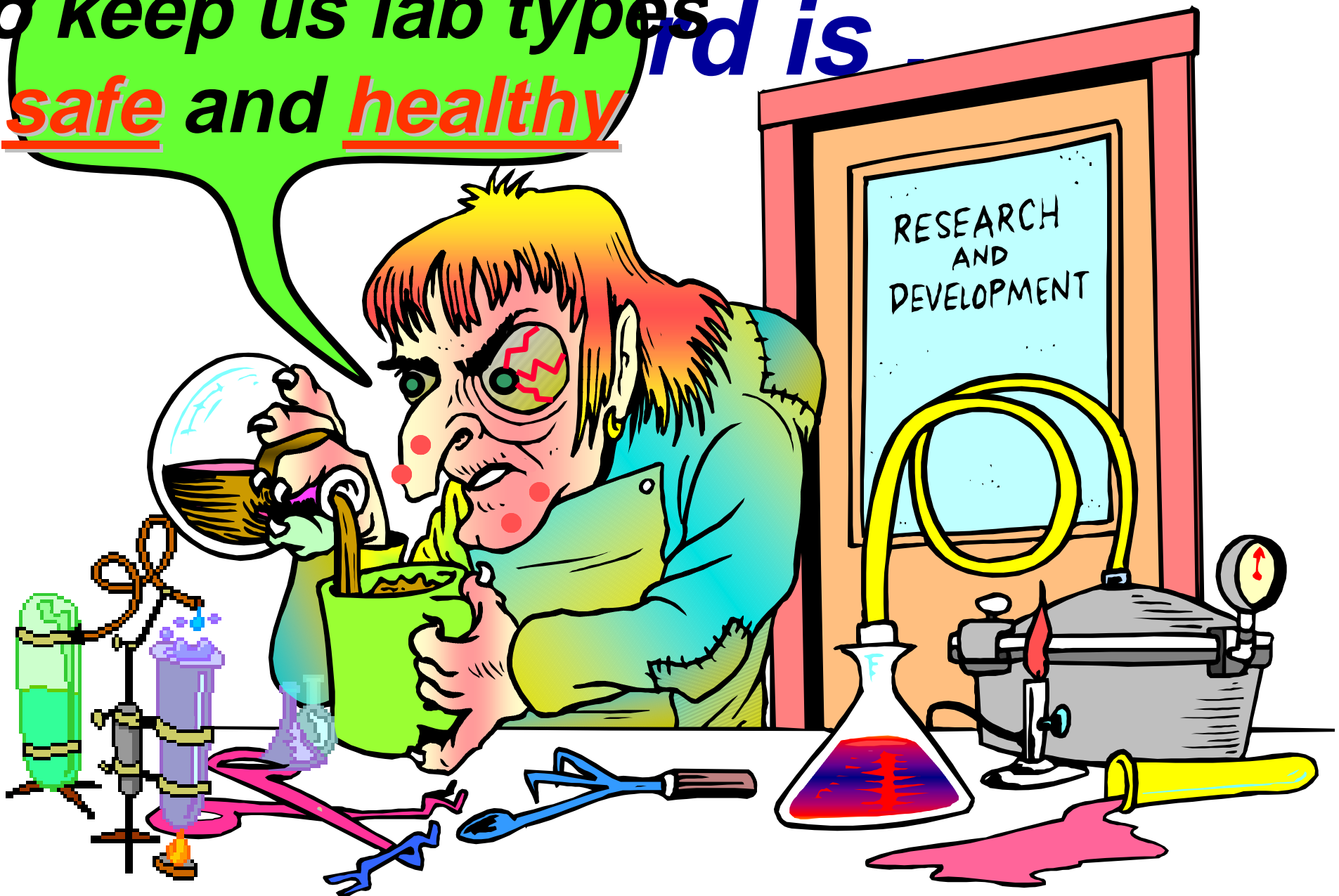
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SIEMENS

Greg DeLuga, P.E.

The goal of a Safety

to keep us lab types
safe and *healthy* *and is*



PROMINENT LABORATORY VENTILATION STANDARDS OF NORTH AMERICA

Designing Using & Testing Laboratory Ventilation Systems

NFPA 45 Fire Protection For Laboratories Using Chemicals *(Current Edition: 2000)*

National Fire Protection Association
Batterymarch Park,
Quincy, MA 02269 - 9904

(800) 344 – 3555
<http://catalog.nfpa.org>

ANSI/AIHA No. Z9.5 Laboratory Ventilation Standard *(Current Edition: 2003)*

American Industrial Hygiene Association
2700 Prosperity Av
Suite 250, Fairfax, VA 22031

(703) 849 - 8888
<http://www.aiha.org/market2.html>

Laboratory Hood Face Velocity



100 FPM = 1 1/8 MPH

Average

“The average face velocity of the hood shall produce sufficient capture and containment of hazardous chemicals generated under as used conditions.”

.... AIHA Z9.5

“Chemical fume hood face velocities and exhaust volumes shall be sufficient to contain contaminants and exhaust them out of the building.”NFPA 45

“Hood shall provide containment at all times when chemicals are present in the hood.”NFPA 45

Exhaust

Work Surface

(by AIHA Z9.5)

prevent:

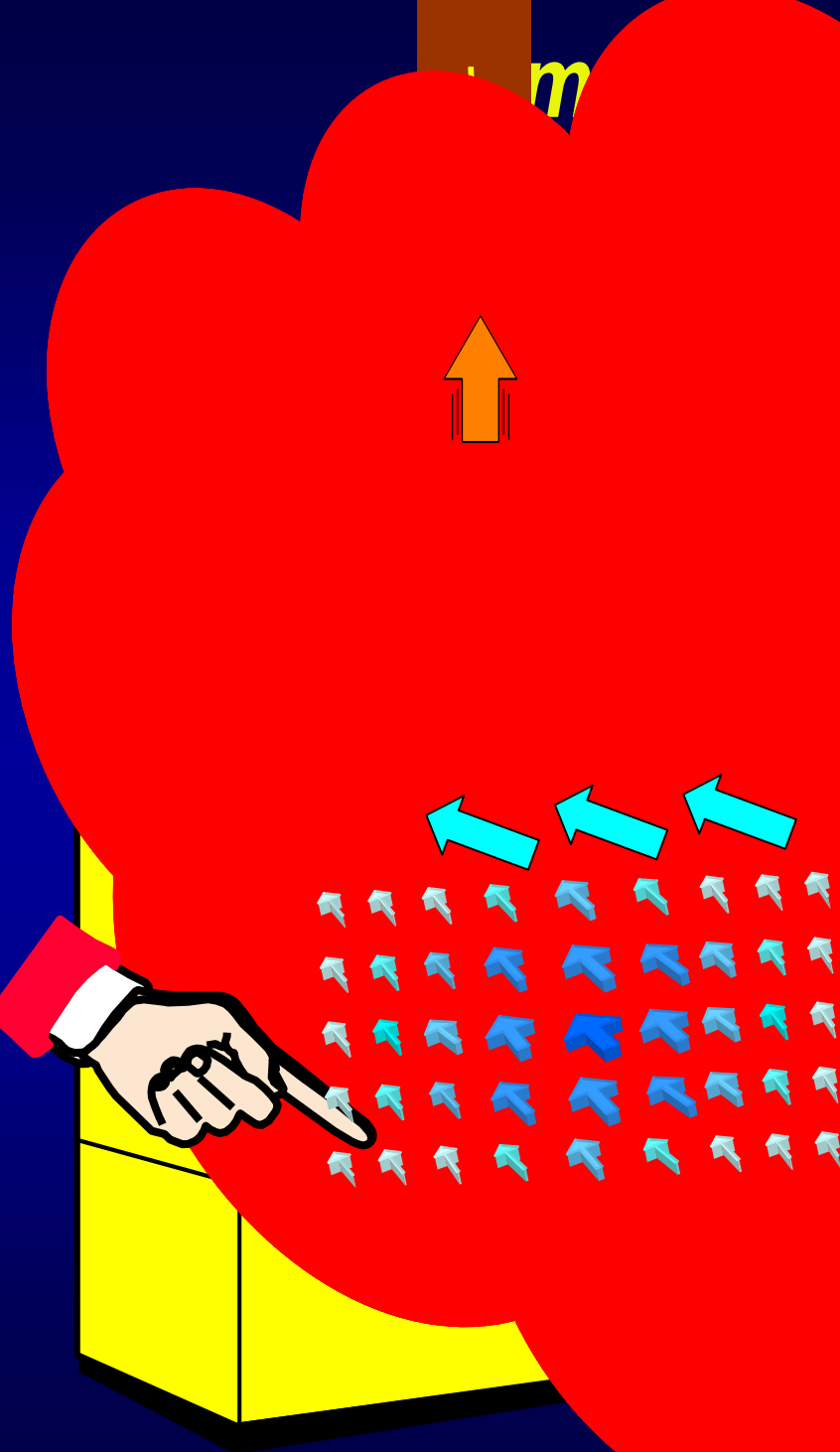
nt

vent:

GE !

prevent:

EXPLOSION !



Laboratory Room Airflow vs. Containment

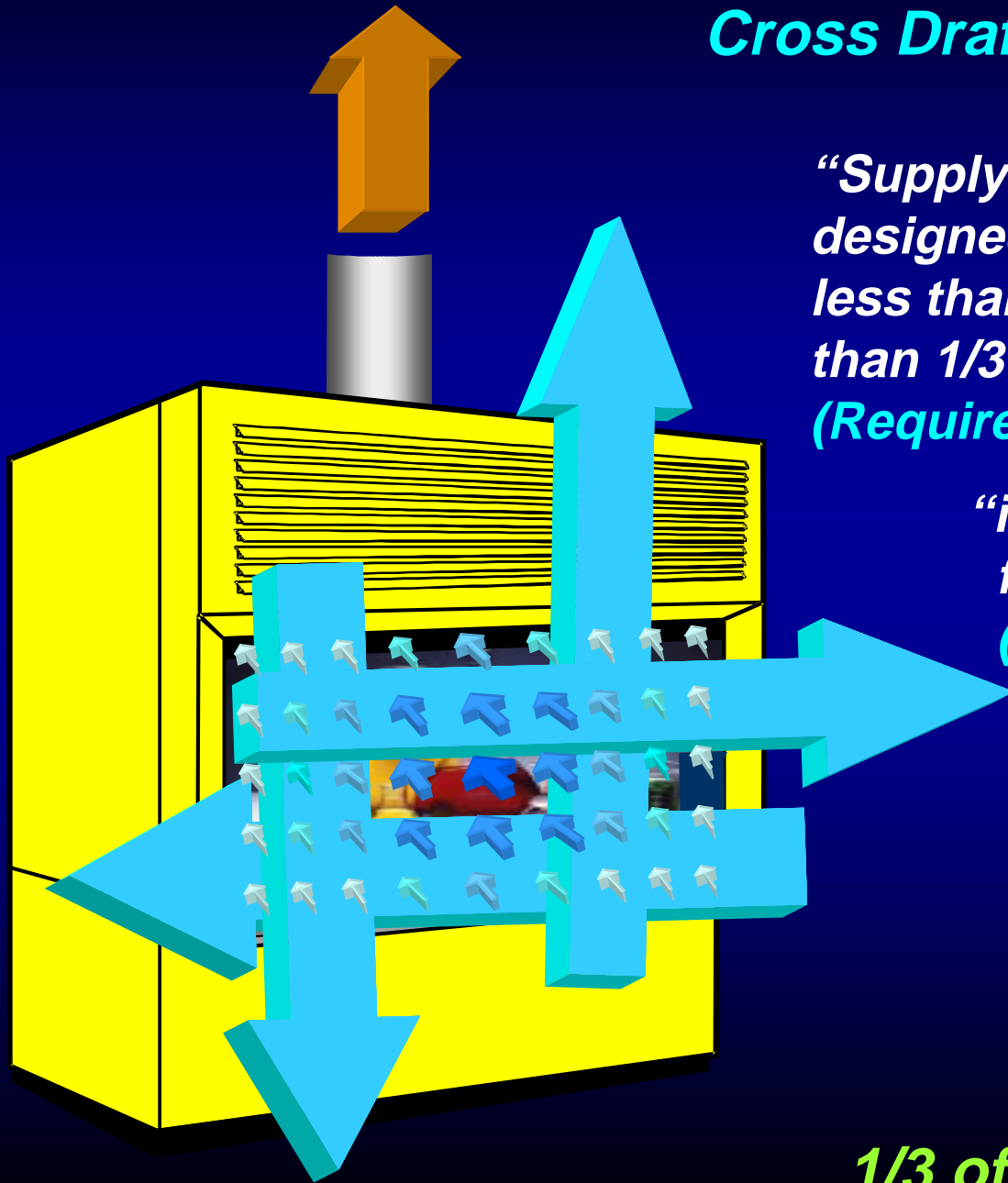
Cross Drafts (Cross Currents):

“Supply air distribution shall be designed to keep air jet velocities less than half and preferably less than 1/3 of the face velocity.”

(Required by AIHA Z9.5)

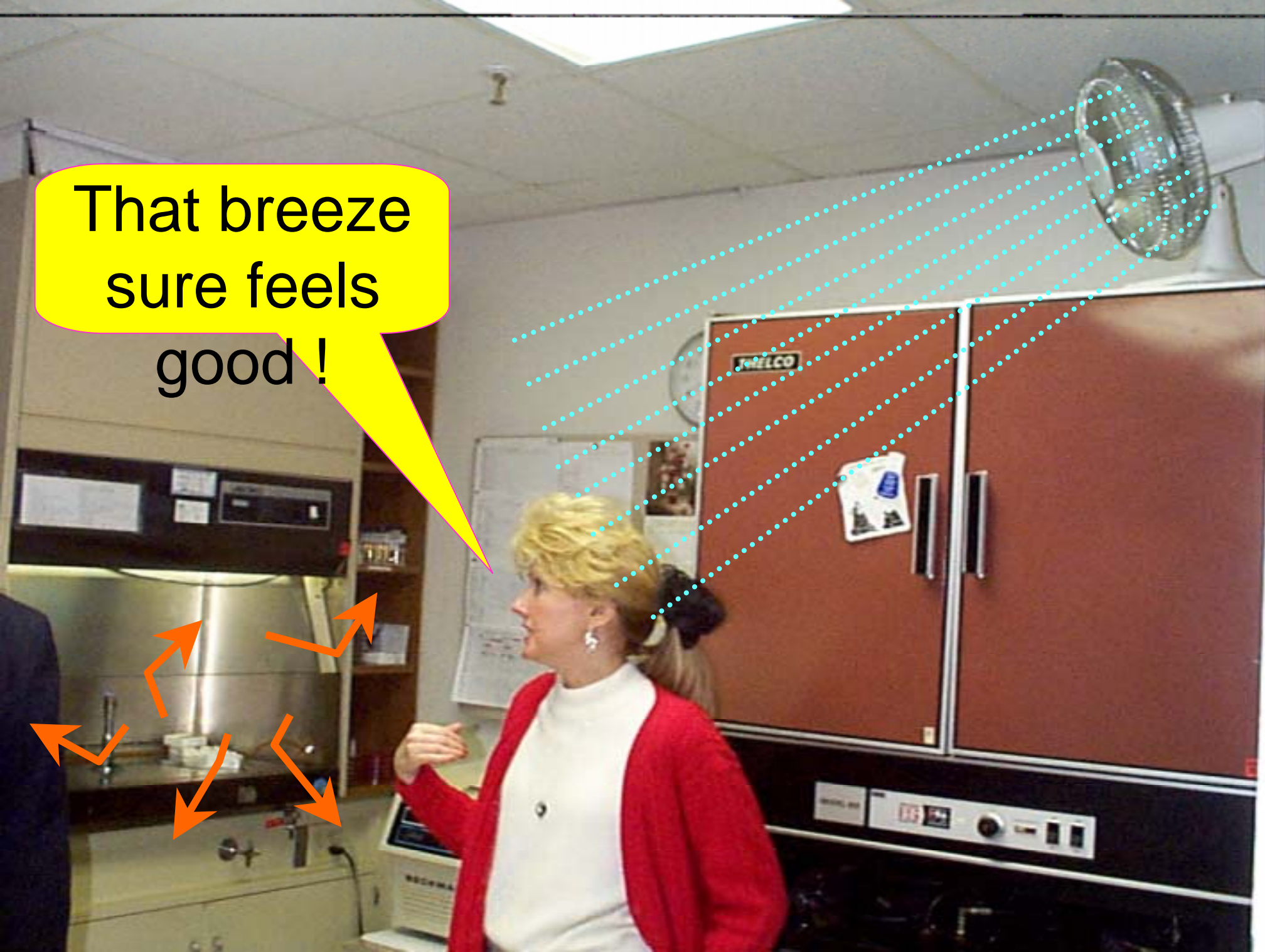
“ideally less than 30% of the face velocity”

(Advised by NFPA 45)



1/3 of 100 FPM = 33 FPM

That breeze
sure feels
good !



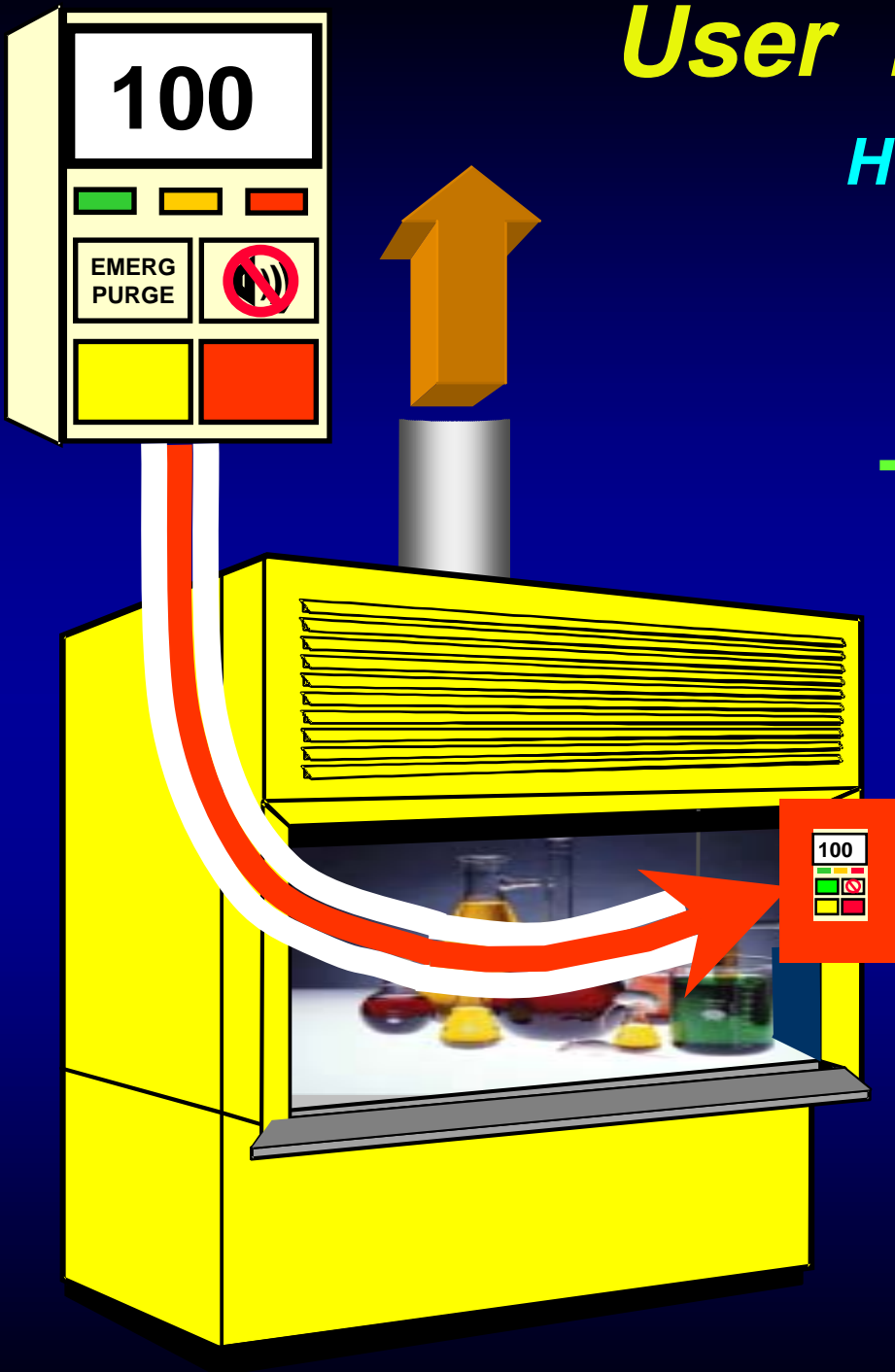
User Indication

Hood Airflow Measuring Device:

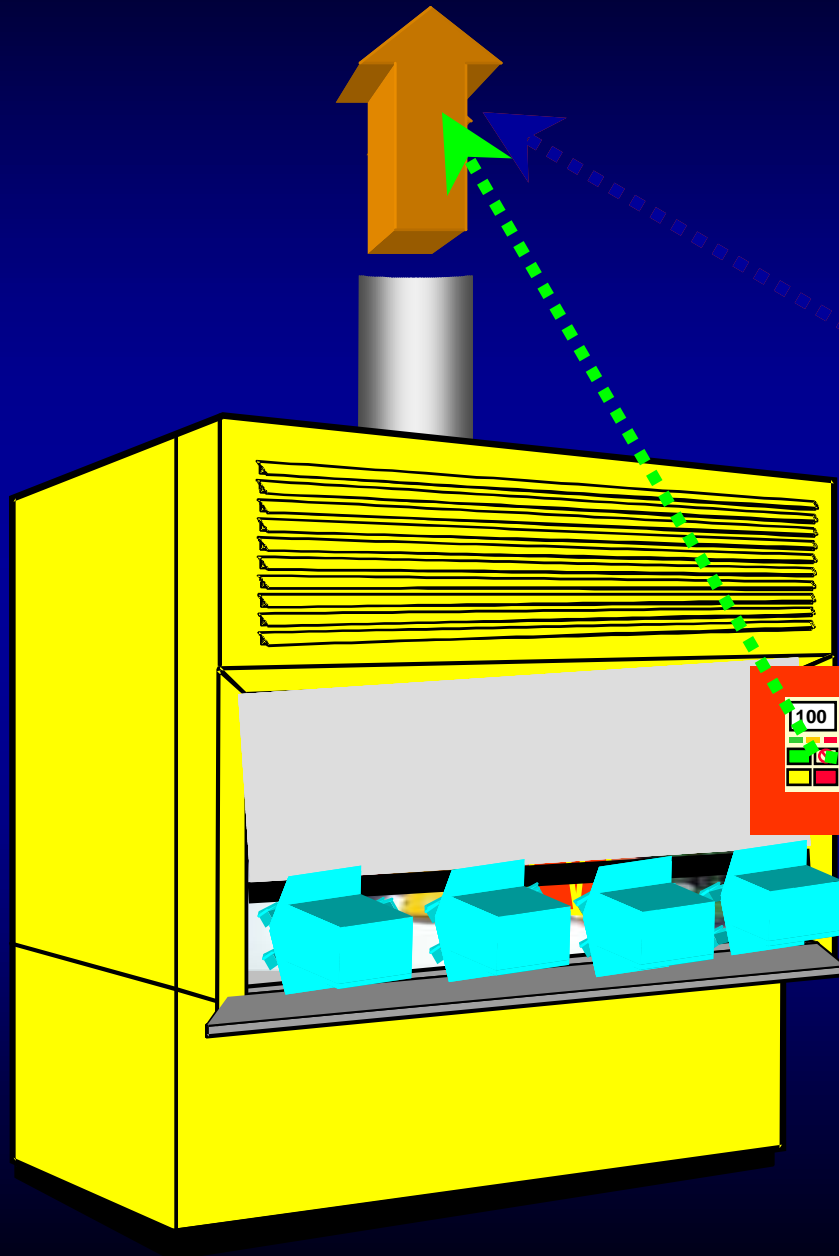
“shall be provided on each laboratory hood”NFPA 45

“All hoods shall be equipped with a flow measuring device or a face velocity alarm indicator.” AIHA Z9.5

- Airflow indication range: $\pm 20\%$ of flow
- Indication of flow alarms
- Calibration annually and whenever damaged



VAV Fume Hood Emergency Exhaust Airflow



Fire emergency mode of operation shall maximize hood exhaust airflowAIHA Z9.5



Room Fire Detection

User

Hoods shall be equipped with a user accessible means to maximize exhaust airflow regardless of sash positionNFPA 45

Myths vs Fact

Standards set room for pressure treatments.

No! AIHA Z9.5  **low hazard to high hazard.**

NFPA 45 or “Piggyback”

Standards rec

No! NFPA 45  **react to**

changing com/closing, and

other short te

AIHA Z... es th... use should

be in the

Negatively pressurized rooms may prevent the room exit door from being opened in an emergency.

No! Typical negative pressures of 0.01 to 0.02 in. w.g. will only add about 3 pounds or less to the doorknob force.

Laboratory Room Pressurization

Myths vs. Fact

Room Differential Pressure (dP) is a function of:

- a. Differential Airflow & Room Volume?
- b. Differential Airflow & Room Leakage Area?
- c. Differential Airflow & Room Volume & Room Leakage Area?
- b. Differential Airflow & Room Leakage Area.

$$\text{dP Inches W.C.} = \left[\text{Differential Airflow} \div (2610 \times \text{Room Leakage Area}) \right]^2$$



Differential Airflow is in CFM
Room Leakage Area is in Square Feet



*Ref: 2003 ASHRAE Handbook
HVAC Applications - Page 52.5*

NFPA 45 - Specific Fire Protection Requirements:

Laboratory Hood Fire Protection

“Automatic fire protection shall not be required in laboratory hoods or their exhaust systems.”

Laboratory Hood Automatic Exhaust System Shutdown

“Automatic fire dampers shall not be used in chemical fume hood exhaust systems.”

“Fire detection & alarm systems shall not be interlocked to automatically shut down chemical fume hood exhaust fans.”

Fume Hood Shutdown Requirements

1. ~~Hood shall be provided to room ventilation in Res when~~
chemicals are present in the hood.NFPA 45

2. *Maintain Room Negative Pressurization if Hazardous Substances Are Present in Room.*

3. *Remove All Chemicals From Fume Hood.*

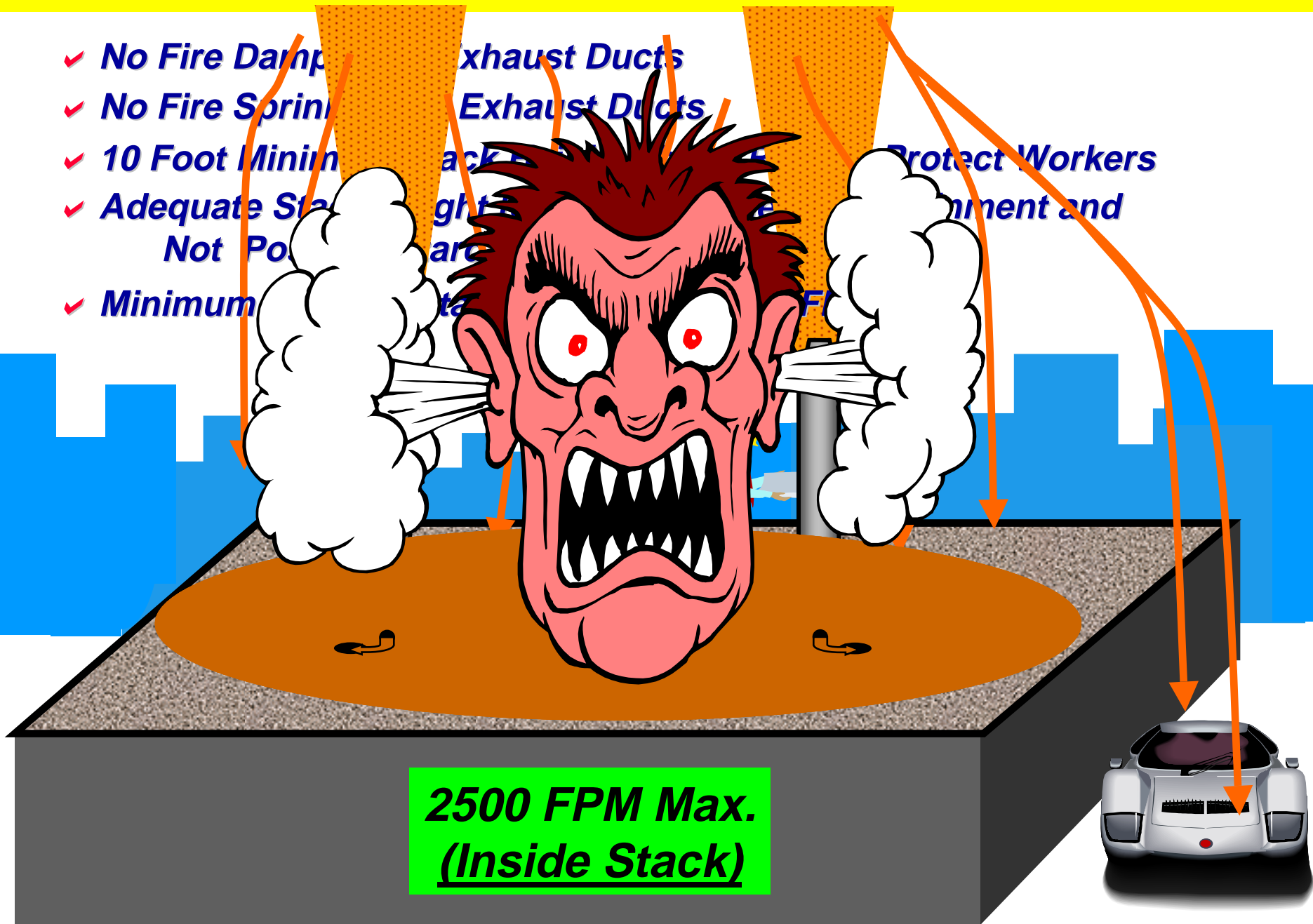
4. *Post Sign*

Warning
Fume Hood is
Not Operational.
Do Not Use !

Exhaust Systems Design Requirements

NFPA 45 & AIHA Z9.5

- ✓ **No Fire Dampers in Exhaust Ducts**
- ✓ **No Fire Sprinklers in Exhaust Ducts**
- ✓ **10 Foot Minimum Clearance to Protect Workers**
- ✓ **Adequate Stack Height to Prevent Recirculation and Not Pose a Hazard to the Public**
- ✓ **Minimum Exhaust Velocity**



**Thank you for your
Attention &
Forbearance**

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